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EXAMINER

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ART UNIT PAPER NUMBER

2621

DATE MAILED: 09/16/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/602,251

Applicant(s)

CARROTT ET AL.

Examiner

Hussein Akhavannik

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 and 21-23 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-19 and 21-23 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 03 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The amendments to the specification overcome the Examiner's objections cited in paragraph 1 of the previous office action.
2. The amendment to claim 16 overcomes the Examiner's objections cited in paragraph 2 of the previous office action.
3. The amendments to the figures overcome the Examiner's objections cited in paragraph 3 of the previous office action.
4. The terminal disclaimer filed July 3, 2003 overcomes the Double Patenting rejection cited in paragraphs 6-9 of the previous office action.

Response to Arguments

5. Applicant's arguments filed July 3, 2003 have been fully considered but they are not persuasive.

The Applicant alleges that the usage of "temporal differences" as recited in claim 1 is supported by the specification on page 7, lines 21-24. The Examiner respectfully disagrees. The Applicant states that "a temporal difference image provides a scalar or reinforcement metric of learning" on page 13 of the Amendment (Paper No. 4). However, such a limitation is not supported by the original specification. The original specification merely explains that two images are compared on a point-by-point basis to obtain a difference image which emphasizes the temporal changes which have occurred. Such a comparison is explicitly illustrated by Yanagita et al in figure 2 by the temporal subtraction image (S8). The original specification does not teach or suggest a reinforcement metric indicating a scalar of how good/bad, how much

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change (vector), or how strongly (acceleration) an action is happening. Therefore, limiting the definition of a “temporal difference” to include such a reinforcement metric is not supported by the original specification and constitutes new matter. Furthermore, it is not understood what these metrics are, how they are calculated, or where they are stored in the difference image.

The Applicant alleges that Yanagita et al performs “basic subtraction processing”, which is different than the temporal difference image provided by the amended claims. The Examiner respectfully disagrees. The original specification explains on page 7, lines 24-29 that the temporal difference image merely subtracts the pixels of a normalized historical image from those of a normalized new image and stores those difference values in a temporal difference image. This is exactly the same processing as performed by Yanagita et al as illustrated in figure 2. Therefore, the subtraction processing of the present application is as “basic” as the subtraction image of Yanagita et al.

The Applicant alleges that Yanagita’s temporal subtraction image does not provide metrics or other direct scientific information. The Examiner respectfully disagrees. The temporal subtraction image of Yanagita et al is explained to provide the (intensity) difference of each pixel between two images taken at different times in column 8, lines 3-13. Therefore, the greater the difference between corresponding pixels of the two images (S1 and S2), then the greater the intensity of the corresponding difference pixel. Thus, the temporal difference image of Yanagita et al does provide direct scientific information about a change that has taken place over time. Furthermore, if the Applicant alleges that by taking a temporal difference of two images direct scientific information is obtained, then why isn’t the same scientific information obtained by Yanagita et al when the temporal subtraction image is calculated?

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The Applicant alleges that the temporal difference image claimed can be applied to “limits, thresholds, ranges, rates of change, or other preset parameters”, whereas the temporal subtraction image of Yanagita et al is open to interpretation. The Examiner respectfully disagrees. Yanagita et al explicitly explain a thresholding operation on a subtraction image in column 9, lines 23-26. Therefore, the temporal subtraction image of Yanagita et al is not any more open to interpretation than the temporal difference image of the present invention.

The Applicant alleges that the added text (matter) is “either implicit in the discussion found in the original application or concerns inherent characteristics of temporal learning which would be well known to those of ordinary skill in the art.” The Examiner respectfully disagrees. The Examiner is not aware where in the original specification the added metrics are explained or suggested. Furthermore, if the metrics were obvious to one of ordinary skill in the art, then they would have been an obvious enhancement to the system of Yanagita et al and would not be patentably significant.

Specification

6. The amendment filed July 3, 2003 is objected to under 35 U.S.C. 132 because it introduces new matter into the disclosure. 35 U.S.C. 132 states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows:

The definition of the “temporal differences” to include a metric indicating a scalar of how good/bad, how much change (vector), or how strongly (acceleration) an action is happening is not supported by the original specification.

Applicant is required to cancel the new matter in the reply to this Office Action.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

8. Claims 1-19 and 21-23 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Referring to claims 1, 11, and 19, which explain temporal image differences, it is not understood, to the extent which the Applicant is drawn to defining temporal differences, how the temporal differences constitute metrics which indicate a scalar of how good/bad, how much change (vector), or how strongly (acceleration) an action is happening. The types of metrics, their calculation, or their storage is not conveyed clearly by the Applicant to allow one of ordinary skill in the art at the time the invention was made to determine these metrics and use them.

Referring to claims 2-10, 12-18, and 21-23, these claims are indefinite for depending from an indefinite antecedent base claim.

9. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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10. Claims 6-7 and 9-10 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Referring to claims 6, 7, 9, and 10, these claims recite the limitation "said composite image". There is insufficient antecedent basis for this limitation in the claims.

Claim Rejections - 35 USC § 102

11. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

12. Claims 1 and 9-10 are rejected under 35 U.S.C. 102(e) as being anticipated by Yanagita et al (U.S. Patent No. 5,982,953).

Referring to claim 1,

- i. Obtaining a first image of a region of tissue is illustrated by Yanagita et al in figure 2, reference number S1.

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- ii. Obtaining a second image of a region of tissue is illustrated by Yanagita et al in figure 2, reference number S2.
- iii. Digitally storing the first and second images is illustrated by Yanagita et al in figure 1, reference number 1, as the image storage section. Yanagita et al explain that the image storage section is capable of digitally storing a plurality of frames of digital data in column 6, lines 35-40.
- iv. Spatially adjusting at least one of the first and second digitized images to spatially register the images so that corresponding features in both images are mapped to corresponding positions is illustrated by Yanagita et al in figure 2, reference number S5. Yanagita et al explain that the position of the common radiographic object is registered between a plurality of frames in column 6, line 66 to column 7, line 13.
- v. Creating a derived image that visually emphasizes temporal differences between the first and second images is illustrated by Yanagita et al in figure 2, reference number S8. Yanagita et al explain that the two images are subtracted from each other after registration to create a subtraction image in column 9, lines 12-22.

Referring to claim 9,

- i. Comparing an image intensity at a location in the first image with a respective intensity at a corresponding location in the second image is explained by Yanagita et al in column 9, lines 12-16. The pixel values are representative of

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the intensity at a location in the first image and corresponding location in the second image.

ii. Determining a temporal difference image value based upon the temporal difference between the image intensity at the location in the first image and the respective intensity at the corresponding location in the second image is explained by Yanagita et al in column 9, lines 12-16. The corresponding pixel values of the first and second image are subtracted from each other to create a subtraction image.

Referring to claim 10, the composite image visually emphasizing image differences by representing various regions of the composite image in synthetic colors, based upon image differences between the first and second images is explained by Yanagita et al in column 13, lines 19-25. By changing the hue depending on the difference value, the difference values would be represented by different colors.

Claim Rejections - 35 USC § 103

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

14. Claims 2-3 and 5-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yanagita et al in view of Kawachi et al (U.S. Patent No. 6,285,787).

Referring to claim 2,

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- i. Determining a coordinate transformation which produces at least a pre-determined degree of correlation between the first and second images is not explicitly explained by Yanagita et al. However, Kawachi et al do explain performing cross-correlation between two images until a pre-determined degree of correlation is obtained in column 7, lines 7-13 and illustrated in figure 8. The model image is shifted across the region measurement image until the reference value is exceeded. Therefore, the shift value of the model image at the point where the reference value is exceeded will represent the alignment amount necessary to register the two images. The cross-correlation method of Kawachi et al could be implemented in the registration processing of Yanagita et al so that two images can be registered correctly. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to determine a coordinate transformation to produce a pre-determined degree of correlation between two images when aligning the images.
- ii. Applying the coordinate transformation to at least one of the first and second digitized images to align the images is explained by Yanagita et al in column 6, line 66 to column 7, line 13.

Referring to claim 3,

- i. Applying a plurality of coordinate transformations to one of the first and second digitized images, to obtain a plurality of corresponding adjusted images is not explicitly explained by Yanagita et al. However, Kawachi et al do illustrate applying a plurality of coordinate transforms to the model image (27q) in figure 8.

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The model image is shifted across the measurement region image sequentially.

Each shift of the model image corresponds to a different coordinate transform of that image. When aligning two images, it is always necessary to shift one image in relation to the other. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply a plurality of coordinate transformations an image being aligned with another image.

ii. Cross-correlating the adjusted images with one of the first and second digitized images to produce a correlation output corresponds to claim 2i. At every shifted position, the model image is correlated with the measurement region image.

iii. Selecting a coordinate transformation which produces at least a defined correlation output from its corresponding adjusted image corresponds to claim 2i. The predefined correlation value is illustrated by Kawachi et al in figure 8 as the reference value.

Referring to claim 5, recording the derived image for archiving is illustrated by Yanagita et al in figure 1 by the image memory (7), which can store the output images of the image processing section (5).

Referring to claim 6, storing the composite image on a computer recordable medium is illustrated by Yanagita et al in figure 1 by the image memory (7), which stores the output images of the image processing section and can be read by a computer.

15. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yanagita et al in view of Kawachi et al, further in view of Wang (U.S. Patent No. 6,477,262).

Referring to claim 7, printing an image based on the composite image is not explicitly explained by Yanagita et al or Kawachi et al. However, Wang does illustrate printing an image in figure 1 by the laser film printer (580). Printing to image in order to archive it is well known in the art. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to print an image based on the composite image of Yanagita et al.

16. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yanagita et al in view of Kawachi et al, further in view of Mitchell et al (U.S. Patent No. 5,433,202).

Referring to claim 8, at least one of the first and second images being three-dimensional is not explicitly explained by Yanagita et al or Kawachi et al. However, Mitchell et al do explain producing three dimensional mammography images in column 10, lines 16-22. Producing three-dimensional images of biological tissue is well known in the art of medical imaging to provide a more accurate representation of the tissue being imaged. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to produce three-dimensional breast images.

17. Claims 4, 19, 21, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yanagita et al in view of Kawachi et al, further in view of Trezza (U.S. Patent No. 6,538,791).

Referring to claim 4,

- i. Inputting the first and second images to an optical correlator is not explicitly explained by Yanagita et al. However, Trezza illustrates inputting two images to an optical correlator in figure 1. The first image is the sample image (28) and the second image is the reference image (37). Trezza explains that an optical correlator would be extremely important in the medical field, especially in

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to determine the results of mammography because of high speed in column 1, lines 52-67. An optical correlator could be used in the cross correlation method of Kawachi et al in order to speed up the processing or perform the cross correlations in real time. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to input a first and second image to an optical correlator to perform high speed cross correlation between the images.

ii. Reading the correlation output from the output of the optical correlator is not explicitly explained by Yanagita et al. However, Trezza illustrates reading the correlation from an optical correlator in figure 1 by the output correlation (30). In order to determine if the correlation between two images is above a predetermined level, as in the cross correlation system of Kawachi et al, it would always be necessary to read the correlation output from the correlating device. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to read the correlation output from the output of the optical correlator.

Referring to claim 19,

- i. Receiving the earlier and later images corresponds to claim 1i-ii.
- ii. Register the earlier and later images by controlling an optical correlator to find a position of correlation between the earlier and later images is not explicitly explained by Yanagita et al or Kawachi et al. However, Trezza does illustrate using an optical correlator to find the correlation between two images in figure 1.

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Such a correlator could be used in the cross correlation method of Kawachi et al to determine the coordinate transform which produces at least a predetermined degree of correlation to register the two images in high speed or real time.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to register the earlier and later images by controlling an optical correlator.

iii. Derive a composite image from the earlier and later images corresponds is illustrated by Yanagita et al in figures 22-24.

iv. Computing temporal differences between the earlier and later images corresponds to claim 10.

v. Emphasizing the temporal differences in the composite image corresponds to claim 10.

vi. An optical correlator coupled to the image processor and arranged to correlate the earlier and later images and to output a cross correlation image which is indicative of the position of correlation corresponds to claim 4.

Referring to claim 21, permitting a user to view the composite image on a display is illustrated by Yanagita et al in figure 1 as the image display section (6).

Referring to claim 23,

i. Comparing an image intensity at a location in the first image with a respective intensity at a corresponding location in the second image corresponds to claim 9i.

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- ii. Determining a temporal difference image value based on the correlation output values corresponds to claim 9ii. The correlation output values are available for calculation of a temporal difference in the system of Yanagita et al, Kawachi et al, and Trezza corresponding to claim 3, above.

18. Claims 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yanagita et al in view of Kawachi et al and Trezza, further in view of Wang.

Referring to claim 22, an ultrasonographic imaging system, arranged to communicate ultrasonographic image data to the image processor to provide at least one of the earlier and later images is not explained by Yanagita et al, Kawachi et al, or Trezza. However, Wang does explain acquiring mammography images using ultrasound in column 7, lines 18-44. Using ultrasound imaging systems to acquire images of biological tissue is well known in the art and could be substituted for the imaging system of Yanagita et al. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to an ultrasonographic imaging system to acquire images.

19. Claims 11 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yanagita et al in view of Gur et al (U.S. Patent No. 5,627,907).

Referring to claim 11,

- i. Obtaining an earlier image of a region of tissue corresponds to claim 1i.
- ii. Obtaining the later image of substantially the same region of tissue corresponds to claim 1ii.
- iii. Deriving a temporal difference image, which represents changes between the earlier and later images, corresponds to claim 1iii.

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iv. Combining at least one of the earlier and later images with the temporal difference image, to produce a composite image is illustrated by Yanagita et al in figures 22-24. The images corresponding to mammography images is not explicitly explained by Yanagita et al. However, Gur et al do explain creating a difference between two mammography images in column 9, lines 22-36. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the mammography images of Gur et al as opposed to the chest images of Yanagita et al as they can be easily substituted for each other to determine changed in the region over time.

Referring to claim 16, spatially adjusting at least one of the earlier and later images to aid in registering the images corresponds to claim 1iv.

20. Claims 12-13 and 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yanagita et al in view of Gur et al, further in view of Kawachi et al.

Referring to claim 12, this claim corresponds to claim 5.

Referring to claim 13, this claim corresponds to claim 6.

Referring to claim 17, this claim corresponds to claim 2.

Referring to claim 18, this claim corresponds to claim 3.

21. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yanagita et al in view of Gur et al and Kawachi et al, and further in view of Wang.

Referring to claim 14, this claim corresponds to claim 7.

22. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yanagita et al in view of Gur et al and Kawachi et al, further in view of Mitchell et al.

Referring to claim 15, this claim corresponds to claim 8.

Conclusion

23. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

24. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hussein Akhavannik whose telephone number is (703)306-4049. The examiner can normally be reached on M-F 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo H. Boudreau can be reached on (703)305-4706. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)305-3900.

Hussein Akhavannik

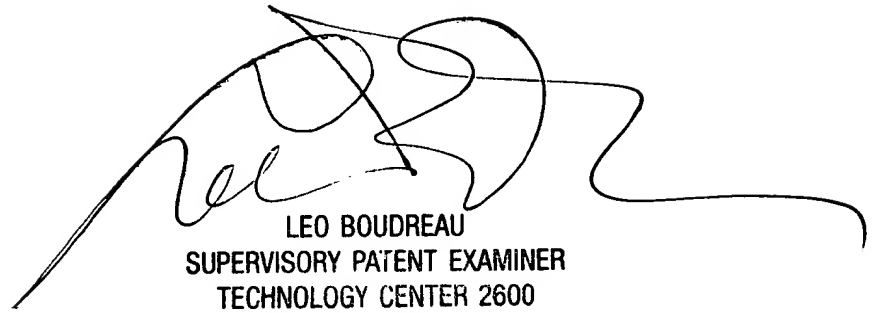
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September 10, 2003

H-A.



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